



Department of Geomatics  
UNIVERSITY *of* ALASKA ANCHORAGE

# Geodetic Measurements and Products

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# About Bill Hazelton

- \* **B. Surveying and Ph.D., University of Melbourne, Australia**
- \* **Industry and professional experience, including in Antarctica**
- \* **Higher education teaching for over 15 years**
- \* **Chair, Department of Geomatics, UAA**
- \* **Cover GIS, LIS, geodesy, surveying, remote sensing, photogrammetry, etc.**

# About UAA Geomatics

- \* **B.S. in Geomatics program for 20 years**
- \* **Covers broad range of geomatics courses, including hydrographic surveying and coastal mapping, plus photogrammetry and remote sensing**
- \* **A.A.S. in Geomatics program for 40 years**
- \* **Certificate and Minor in GIS**
- \* **Will be working towards implementing a graduate program this year**
- \* **Four faculty with diverse backgrounds, plus adjuncts**

# NOAA's Role

## \* **The Big Picture:**

\* **NOAA produces decision-support products and services**

\* **NOAA's work supports the transition to a post-industrial economy, based on information, knowledge and services**

\* **NOAA's work supports efficient transportation of material goods**

\* **NOAA's work supports the global economy and the US's role in it**

\* **NOAA is a key player in the US's move to a post-industrial economy**

# NOAA's Responsibilities

- \* **Looking at the various NOAA responsibilities and authorities which HSRP reviews, it is possible to group them in various ways**
- \* **One such grouping is:**
  - \* **Location dependent, particularly horizontal location:**
    - \* **Hydrographic and shoreline surveying, nautical charting, current measurements, geospatial measurements, geomagnetic measurements**
  - \* **Location dependent, particularly vertical location:**
    - \* **Hydrographic and shoreline surveying, nautical charting, water level measurements, geospatial measurements**

# Geodetic Measurements

- \* **Location depends upon geodetic measurements and products**
- \* **Geodetic measurements are therefore foundational for NOAA's mission**
- \* **Geodetic measurements provide the foundation for data integration**
- \* **Geodetic measurement products, such as datums and geoids, are critical for almost every aspect of NOAA's work, as well as the larger community that use geospatial data from any source.**

# Geodetic Products

- \* **When collecting spatial data, the ability to link it to other data requires the addition of ‘intelligence’ to the measurements**
- \* **The foundation for linking spatial data is connection to a common datum**
- \* **Datums, such as NAD83 and the geoid, are generally abstract entities that must be realized before they can be used**
- \* **This requires points on the ground that are already linked to the datum, followed by measurements relative to that point**

# Geodetic Products

- \* **Alaska has very little traditional survey control, unlike the Lower 48**
- \* **This is a consequence of Alaska's lack of roads**
- \* **Continually Operating Reference Stations (CORS) will be the basis for realization of datums in Alaska into the foreseeable future**
- \* **A dense network of CORS has enabled development of virtual reference networks, adding value to CORS and better meeting user needs**
- \* **Good, solid foundation infrastructure enables more than it costs**

# Some Results

- \* **In the period 1999 to 2009, there were several updates to the geoid model**
- \* **In Ohio, the changes were small: centimeters at most**
- \* **At UAA, GEOID 06 was about 2.1 meters different to GEOID 99**
- \* **Shift back of 21 mm between GEOID 06 and GEOID 09**
- \* **Mean shift of about 0.6 meters across the entire Alaska region between GEOID 06 and GEOID 09**
- \* **An indication of what the inclusion of quality modern data can do**

# Geodetic Measurement

- \* **Stand-alone GNSS can provide location to a couple of meters horizontally and perhaps 15 meters vertically**
- \* **This is sufficient for most common navigational needs, but not sufficient for much of NOAA's data collection**
- \* **It is also insufficient for a range of other research and construction applications, especially vertical location**
- \* **Connection to a known point (a CORS) is necessary for connection to the datum**

# Realization of Datums

- \* **GNSS (GPS, GLONASS, Galileo, etc.) will provide the backbone of geospatial measurement in Alaska for the foreseeable future**
- \* **Successful connection of such geospatial measurements to common datums requires a reasonably dense CORS network**
- \* **This is particularly the case for vertical datums**
- \* **NGS is working with GRAV-D and Grace satellite data to refine the geoid, but its only realization across Alaska will be through CORS**

# Datums and Data

- \* **As one example, there is a National Park in Alaska with an area equivalent to West Virginia, without a single control point (CORS) within it**
- \* **CORS are very thin on the ground along the western and northern coasts of Alaska, two critical areas for resource development, climate change research and mitigation, food security...**
- \* **The SDMI surface model current being collected for Alaska is estimated to be about 5 petabytes in size, despite being a single layer of a multi-layered statewide dataset**

# What Needs To Be Done

- \* **Determine a stable, modern geoid for Alaska**
- \* **Finalize the vertical datum for the region**
- \* **Establish a dense network of CORS in Alaska**
- \* **Realize the horizontal and vertical datums across the region**
- \* **Increase local partnerships and ‘crowd-sourcing’ to increase effectiveness**
- \* **...and to reduce costs**

# Conclusion

- \* **The geospatial community in Alaska recognizes how far we have come with NOAA's support, as well as how far we still need to go**
- \* **We are deeply appreciative of what NOAA does for Alaska, and we want more!**
- \* **We want to explore ways to keep NOAA effective and funded**
- \* **That will mean making sure NOAA's real mission and effectiveness are thoroughly understood by those controlling the funding**